

TI 30 Xa Calculator:

DISPLAY

ON and OFF

Power OFF when not in use, battery powered.

Y^x Changes A power to A whole Number.
[see next page]

2ND; Function Key, used in conjunction w/ Key 6

1/X; Reciprocal Key, This Key is used extensively.

π; PI Key

X²; X is a number the function Squares the number

EE; Used Extensively, in a formula for **X10[#]**

√X; Square Root

DECIMAL

+/-

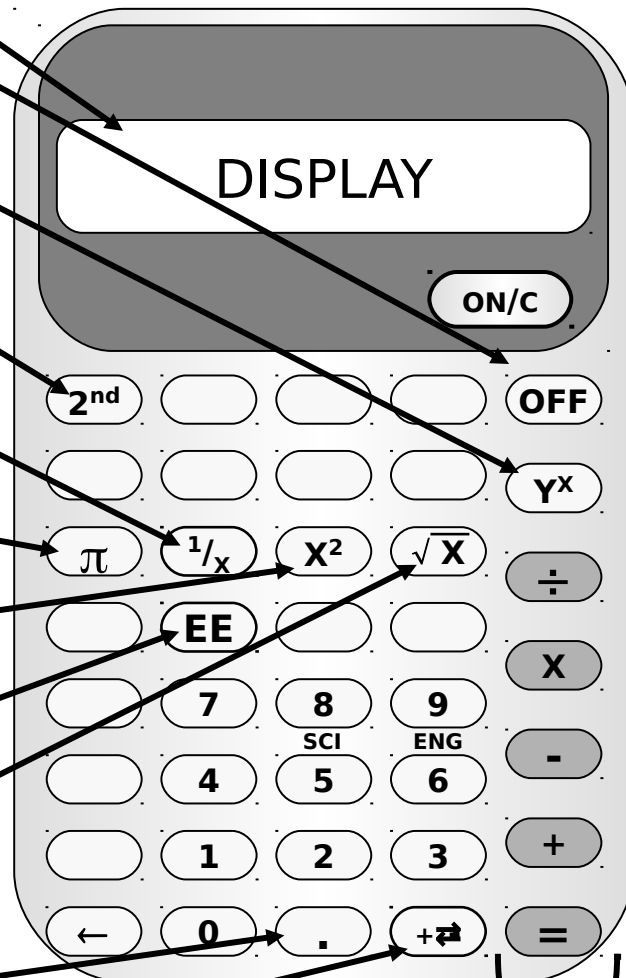
Plus to Minus or **Minus to Plus**

Used Extensively for converting a + power of 10 to a - power of 10.

Commonly Used Keys;

The TI30Xa calculator is the classroom standard, all mathematical equations that require a calculator, will be taught using the TI30Xa.

EE You may see any of the keys boxed when a equation is on the board, this to enable you to separate the Keys from the Numbers.



⇒ **Symbol is not an = sign**, the last function performed displays the solution.

Note: the solution will be displayed in whole units, Roll the decimal & record in prefix values.

DC: Numeric Notations, Ohms Law

NUMERIC NOTATIONS:	Convert;
Power to base No.	2^3 to a base Number; $2 \square Y^X \ 3 = 8$ 10^{-3} to a base number; $10 \square Y^X \ 3 + \square - = 0.001$
Base No. to numeric.	$10000.$ $10 \square EE \ 3 \Rightarrow 10^03$ $.000001$ $1 \square EE \ + \square - \ 6 \Rightarrow 1^{-06}$
PWR to Base No.	10^03 $10 \square EE \ 3 Y^X \Rightarrow 10000.$ 1^{-06} $1 \square EE \ + \square - \ 6 Y^X \Rightarrow$ 0.000001
ADD;	$3 \text{ K} + 5 \text{ M} = 3 \text{ EE}^3 + 5 \text{ EE}^6 = 5003,000.$ Move the decimal 6 places left to = 5.003 M
Subtract;	$5 \text{ M} - 3 \text{ K} = 5 \text{ EE}^6 - 3 \text{ EE}^3 = 4997,000.$ Move the decimal 6 places left to = 4.997 M
Multiply;	$3 \text{ K} \times 5 \text{ M} = 3 \text{ EE}^3 \times 5 \text{ EE}^6 = 1.5^{10}$ Move the decimal 1 places right to = $15. \text{ G}$
Divide;	$5 \text{ m} \div 3 \text{ K} = 5 \text{ EE}^{-3} \div 3 \text{ EE}^3 = .000001667$ Move the decimal 6 places right to = 1.667μ
OHMS LAW:	
E	$E = 50\text{v}, \quad I = 5\text{mA}, \quad R = 10 \text{ K}\Omega$
I	$E = I \times R = 5 \text{ mA} \times 10 \text{ K}\Omega = 5 \text{ EE} + \square -^3 \times 10 \text{ EE}^3 = 50\text{vdc}$
R	$I = E / R = 50 / 10 \text{ K}\Omega = 50 \div 10 \text{ EE}^3 = 0.005\text{A or } 5\text{mA}$ $R = E / I = 50 / 5 \text{ mA} = 50 \div 5 \text{ EE} + \square -^3 = 10000. \text{ or } 10\text{K}\Omega$

SERIES CIRCUIT.

RESISTORS in series;

$$R_T;$$

Ohms Law.

CURRENT in series;

$$I_T;$$

Ohms Law.
Concept.

Voltage Drops;

Kirchhoff's Law

Ohms Law.

$$E_{R\#};$$

Concept.

Prefix Values:

To **KΩ**;

To **mA**

OHMS LAW:

A circuit with only one path for current to flow.

Is additive to equal R_T . The individual resistors values are added together to obtain the total.

$$R_T; \text{ Resistance Total. } R_1 + R_2 + R_{\dots} = R_T$$

$$EA \div IT = RT$$

Current is constant or is the same any where in the Series Circuit [Ckt], or where it is measured in the Ckt.

I_T ; Current Total.

$$EA \div RT = IT$$

Current is always measured across an open Switch. The Meter is placed in series w/ the Ckt.

The sum of the individual Voltage drops is equal to the applied voltage [EA],[ET]. Know as **Kirchhoff's Law.**

$$E_{R1} + E_{R2} + E_{R\dots} = E_A$$

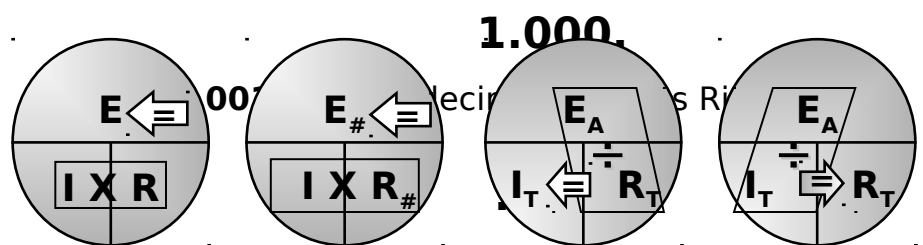
$$I_T \times R_{\#} = E_{R\#}$$

$E_{R\#}$; **E**, Voltage across, **R#**, resistor number#.

In a Ckt w/ more than one resistor the largest resistor will drop the most Voltage, the smallest the least.

The TI calculator used in class always displays the solution in a whole number. You must move the Decimal to place in a prefix value.

1000 Ω, move decimal 3 places left for **1 KΩ**.



DC: CONDENSERS.

DC: SERIES CIRCUITS, TAKING THE MEASUREMENTS.

RESISTANCE:

RT;

Power **OFF.**

S1; Closed.

TP1, Red. TP5,
Black.

R1, 2, 3;

Power **OFF.**

S1; Closed.

R1; TP1, - TP2

R2; TP2, - TP3

R3; TP3, - TP4

VOLTAGE DROPS:

ER1, 2, 3;

Power **ON.**

S1; Closed.

ER1; TP1, - TP2

ER2; TP2, - TP3

ER3; TP3, - TP4

CURRENT:

IT;

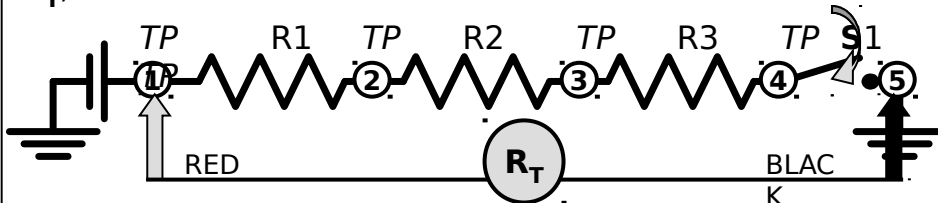
Power **ON.**

S1; **OPEN.**

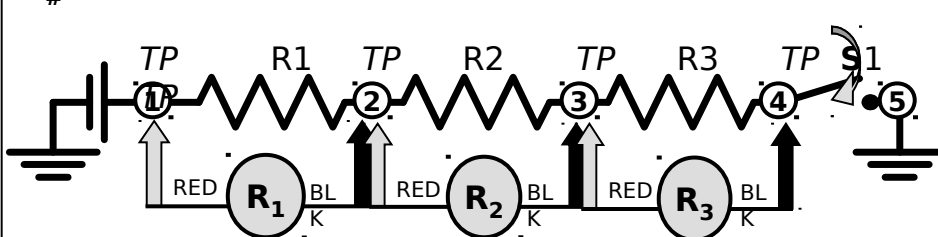
IT; TP4, - TP5

TROUBLESHOOTING :

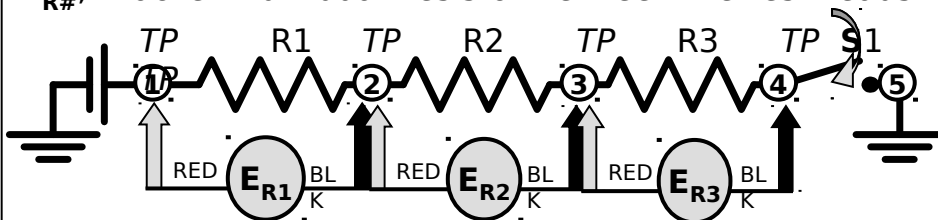
RT, Bracket Entire Ckt Between the Test Leads.



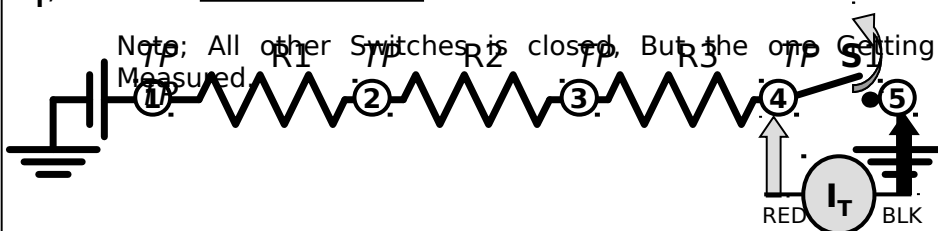
R#, Bracket Individual Resistor Between the Test Leads.



ER#, Bracket Individual Resistor Between the Test Leads.



IT, Bracket OPEN SWITCH Between the Test Leads.



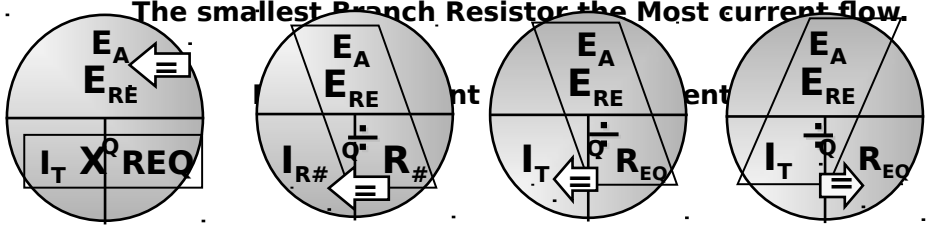
The meter completes the Ckt allowing 100%
of current to flow through the meter.

	OPEN	SHORT
ER#	↑ = EA	↓ = 0 V
RT	↑ = ∞ Ω	↓ Ω

IT

↓ = 0 A

↑

PARALLEL CIRCUITS: Definition;	PARALLEL CIRCUITS: A circuit that has more than one path for current to flow.
RESISTANCE; 3 Methods, of REQ. Like Value; Product Over Sum; Reciprocal; On The TI30Xa Calculator REQ CONCEPT;	Is an equivalency called the REQ. Only in a <u>Pure</u> parallel Ckt it is considered the same as RT. Good only for two or more resistors of the same value. The No. of resistors, over, the like value resistors. Good only for Two resistors of different values. The Product [X] of the two Resistors Over The Sum [+] of the two Resistors $\frac{1}{\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_{\#}}} \Rightarrow REQ \text{ in } \Omega$ Good for all parallel Ckts regardless of the number. $\frac{R_1 \frac{1}{X} + R_2 \frac{1}{X} + R_{\#} \frac{1}{X}}{\text{in } \Omega} = \frac{1}{X} \Rightarrow REQ$
VOLTAGE; E_{REQ}	The REQ will always be smaller than the smallest resistor. Voltage is the same on each of the Branches. Only in a pure parallel Ckt will the normal voltage equal EA.
CURRENT; Total Current, [I_T]; Branch Current, [I_{R#}];	The Voltage drop of the parallel Ckt. $I_T \times REQ$ Current is additive, the sum of the branch currents will equal IT. $I_{R1} + I_{R2} + I_{R\#}.. = I_T$ or $E_{REQ} \div REQ = I_T$
OHMS LAW: Note; EA & EREQ is the same only in a pure parallel Ckt.	The amount of current flowing through an individual branch [resistor] in a Parallel Ckt. The largest Branch Resistor the Least current flow. The smallest Branch Resistor the Most current flow. 

DC: CONDENSERS.

DC: PARALLEL CIRCUITS, TAKING THE MEASUREMENTS.

RESISTANCE:

R_{EQ} ;

Power **OFF.**

S1,2,3; Closed.

TP1, Red. TP4,

Black.

$R_1, 2$;

Power **OFF.**

R_1 ; TP1, - TP4

S1, 3; Closed.

S_2 , OPEN

R_2 ; TP1, - TP4

S2, 3; Closed.

S_1 , OPEN

CURRENT:

I_T ;

Power **ON.**

S_3 ; OPEN.

S1 & 2 Closed

TP4, Red. TP5,

Black.

I_{R2} ;

Power **ON.**

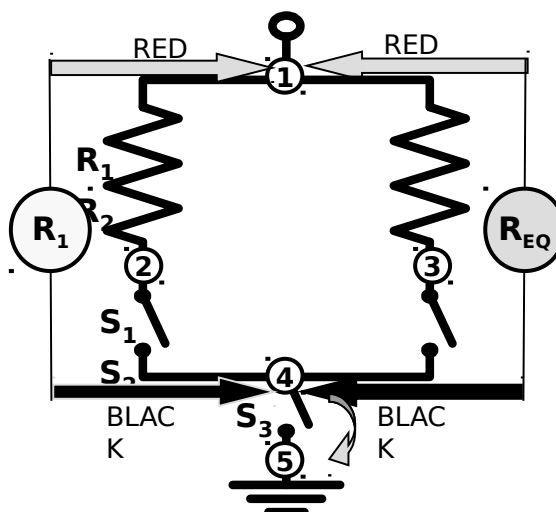
S_2 ; OPEN.

S1 & 3 Closed

TP3, Red. TP5,

Black

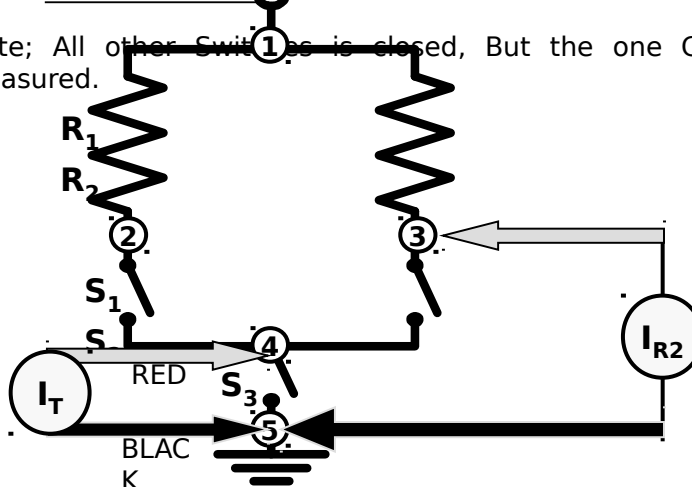
R_{EQ} , Bracket Entire Parallel Ckt Between the Test Leads.



$R_{\#}$, Bracket Individual Resistor Between the Test Leads, Open the switch in the other branch [the one not being measured].

I_T , Bracket OPEN SWITCH Between the Test Leads.

Note; All other Switches is closed, But the one Getting Measured.

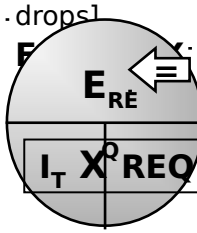
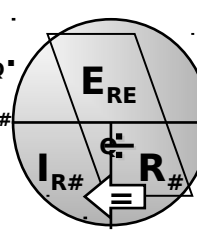
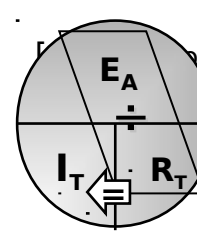
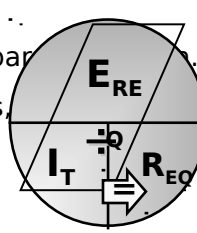


TROUBLESHOOTING

Parallel Circuits

The meter completes the Ckt allowing the current to flow.

	OPEN	SHORT
E_A	"SAME"	$\downarrow = 0 \text{ V}$
R_{EQ}	$\uparrow \Omega$	$\downarrow = 0 \Omega$

DEFINITION; RESISTANCE; REQ; RT;	<u>SERIES PARALLEL CIRCUIT:</u> A combination of the series Ckt w/one path for current flow and a parallel portion of the same Ckt w/more than one path for current flow. Is the resistance that is unique to the parallel portion of the Ckt. RT is the sum of the REQ and any Series resistors in the same Ckt. $REQ + R_1 + R_{\#} = R_T$
VOLTAGE; E_{REQ}	Voltage in a <u>Series Parallel</u> Ckt is the sum of individual voltage drops of the resistors in series Plus the voltage drop of the parallel. $EREQ + ER1 + ER\# = EA$, [Kirchhoff Law] The voltage drop of the parallel portion of the Ckt. $IT \times REQ = EREQ$
CURRENT; Total Current, [IT]; Branch Current, [IR#];	Current is <u>additive</u>, in the <u>parallel</u> portion, the sum of the branch currents equal IT. Current is <u>constant [same]</u> in the <u>series</u> portion to = IT $EA \div RT = IT$
OHMS LAW: Order of President for Calculations.	$IR1 + IR2 + IR\#.. = IT$ or $EREQ \div REQ = IT$ $EA = IT \times RT$ [Voltage applied]. $REQ = R_1 \frac{1}{x} + R_2 \frac{1}{x} + R_3 \frac{1}{x} = \frac{1}{x}$ [Parallel portion.] $RT = REQ + R_1 + R_2 + R_3...$ [Series portion + REQ, Parallel.] $IT = EA / RT$ [/ means divide] $ER\# = IT \times R\#$ [Series portion resistors voltage drops] $E_{R2,3}$    

DC: CONDENSERS.

DC: SERIES PARALLEL CIRCUITS, TAKING THE MEASUREMENTS.

RESISTANCE:

R_T ;

Power **OFF**.

S1; Closed.

TP1, Red. TP4,
Black.

R_{EQ} ;

Power **OFF**.

S1; Closed.

TP3, Red. TP4,
Black.

R_1 ;

Power **OFF**.

S1; Closed.

TP1, Red. TP2,
Black.

$R_{\#}$, Bracket Individual Resistor Between the Test Leads, Open the switch [if available] in the other branch

CURRENT:

I_T ;

Power **ON**.

S1; **OPEN**.

S2 & 3 Closed

TP2, Red. TP3,
Black.

I_{R2} ;

Power **ON**.

S2; **OPEN**.

S1 & 3 Closed

TP4, Red. TP6,
Black

I_{R3} ;

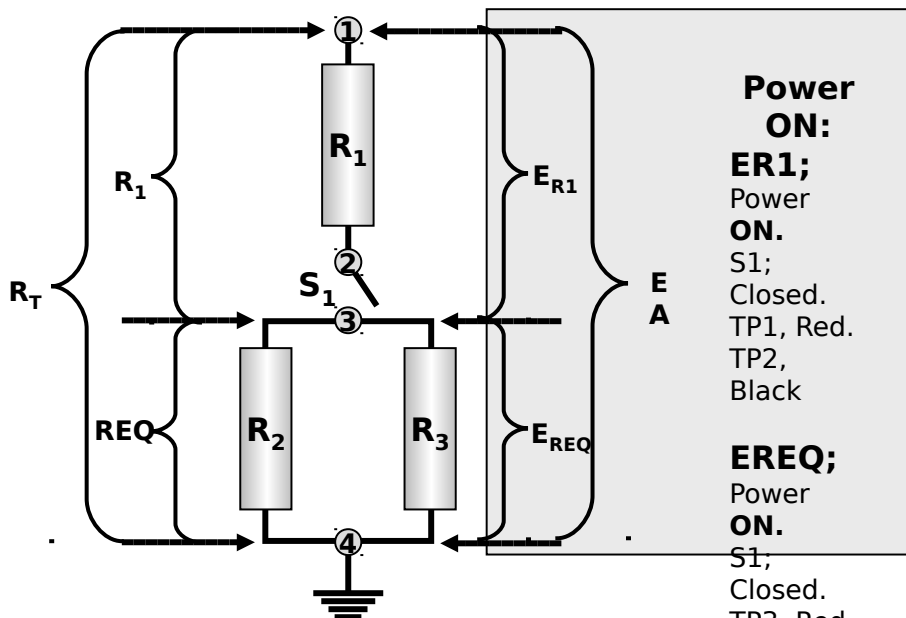
Power **ON**.

S3; **OPEN**.

S2 & 3 Closed

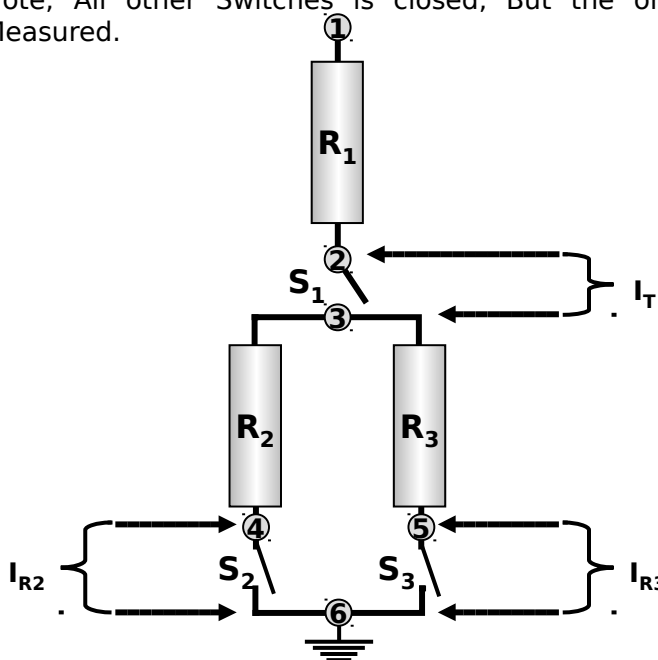
TP5, Red. TP6,
Black

Bracket the portion of the Ckt Between the Test Leads you are measuring.



I_T , Bracket OPEN SWITCH in series portion Between the Test Leads.

Note; All other Switches is closed, But the one Getting Measured.



PARALLEL

OPEN

E_A "SAME"

$R_{EQ} \uparrow \Omega$

SHORT

$\downarrow = 0 V$

$\downarrow = 0 \Omega$

OBSERVES

E_A "SAME"

$R_T \uparrow = \infty \Omega$

$I_T \downarrow = 0 A$

SHORT

$\downarrow V$

$\downarrow \Omega$

$\uparrow$

$I_T \downarrow I_{R\#} \downarrow = 0 A \uparrow$ "MAX"